

# **Low-Level Burial Ground 3 Trenches 31 and 34 DQO Process**

**Presented to: Washington State  
Department of Ecology**

Prepared for the U.S. Department of Energy  
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy  
under Contract DE-AC06-08RL14788



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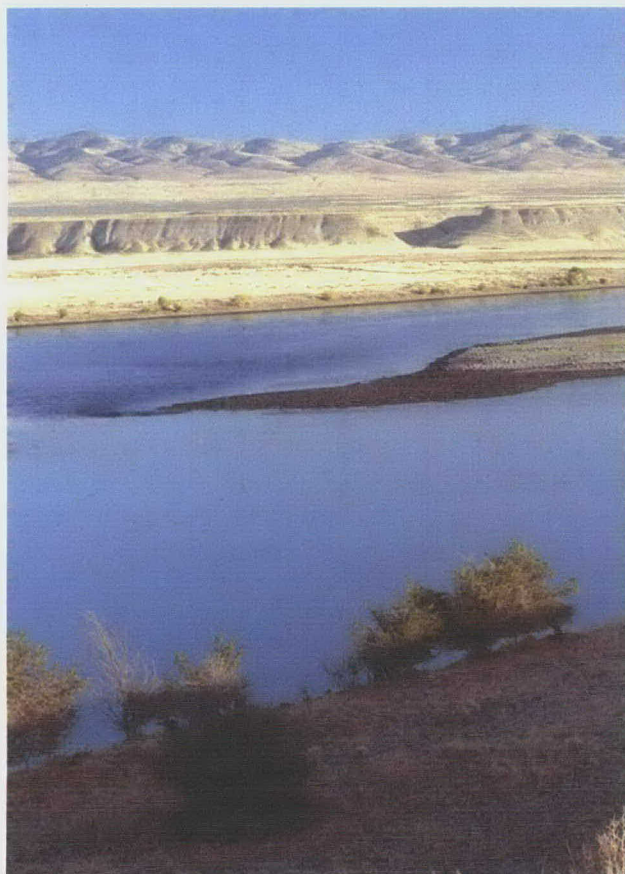
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Presented to: Washington State  
Department of Ecology

Presented by: Daniel Gamon

CHPRC1009-11



# Low-Level Burial Ground-3 Trenches 31 and 34 DQO Process for New Well Locations

## Contributors:

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ZP-1 Modeling Data and Support by:

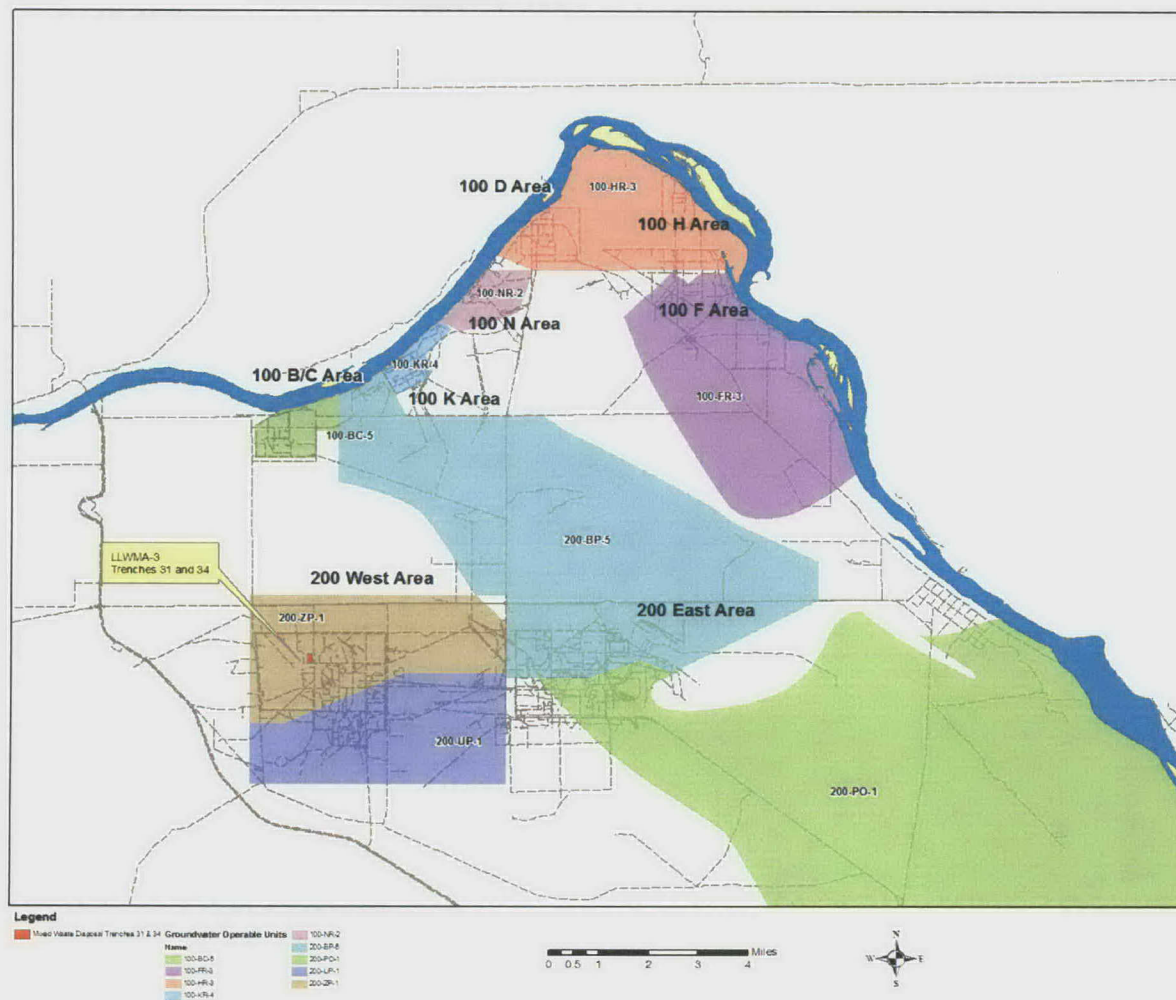
S. S. Papadopoulos & Associates, Inc.



# Key Element of DQO Process

*In order to comply with RCRA Dangerous Waste TSD requirements, monitoring wells need to be located for Trenches 31 and 34 in the 218-W-5 Low Level Burial Ground. The locations need to consider planned hydrologic impacts from CERCLA injection wells with respect to water elevations, flow directions, and water chemistry.*

# Location Map of Study Area



U.S. DEPARTMENT OF  
**ENERGY**



**CH2MHILL**  
Plateau Remediation Company



# Conceptual Site Model – Well Location Variables

- Local hydrogeology under the TSD Unit
- Flow path of conceptual dangerous waste to water table from a release from the TSD Unit
- Define “up-gradient” in relation to LLWMA-3 Trenches 31 & 34
- Define “down-gradient” in relation to Trenches 31 & 34
- Present time series of estimated ZP-1 Pump and Treat operations hydrologic effects relative to the possible new monitoring well locations
- Discuss relevant timing of monitoring well construction and ZP-1 Pump and Treat operations

# Trench 31 and 34 Details

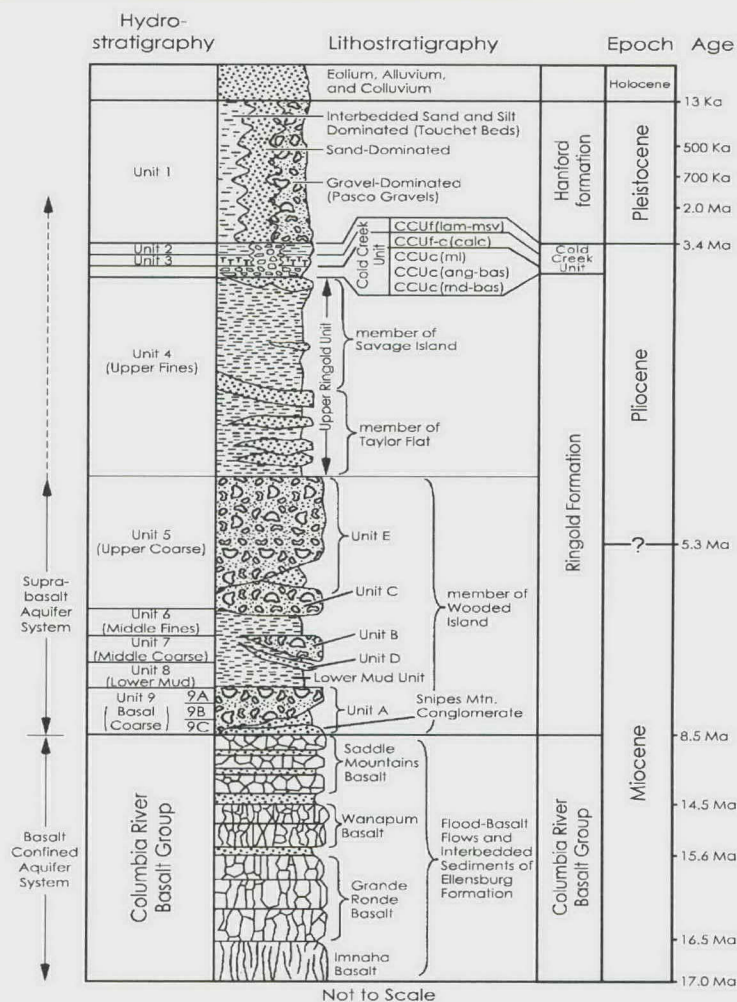
- The double lined trenches were constructed in 2000 and are 36 m (118.1 ft) wide at the bottom, 9.1 m (29.9 ft) deep, and 230 m (754.6 ft) long.
  - Adjacent to the double lined mixed waste trenches are leachate collection tanks.
- The two 218-W-5 Burial Ground double-lined mixed waste trenches are the only trenches that continue to receive mixed waste.
  - The 218-W-5 Burial Ground received packaged waste materials from 200 West Area operations, as well as other wastes from the Hanford Site and offsite.
  - Examples of waste disposed to this burial ground include rags, paper, rubber gloves, disposable supplies, and broken tools.



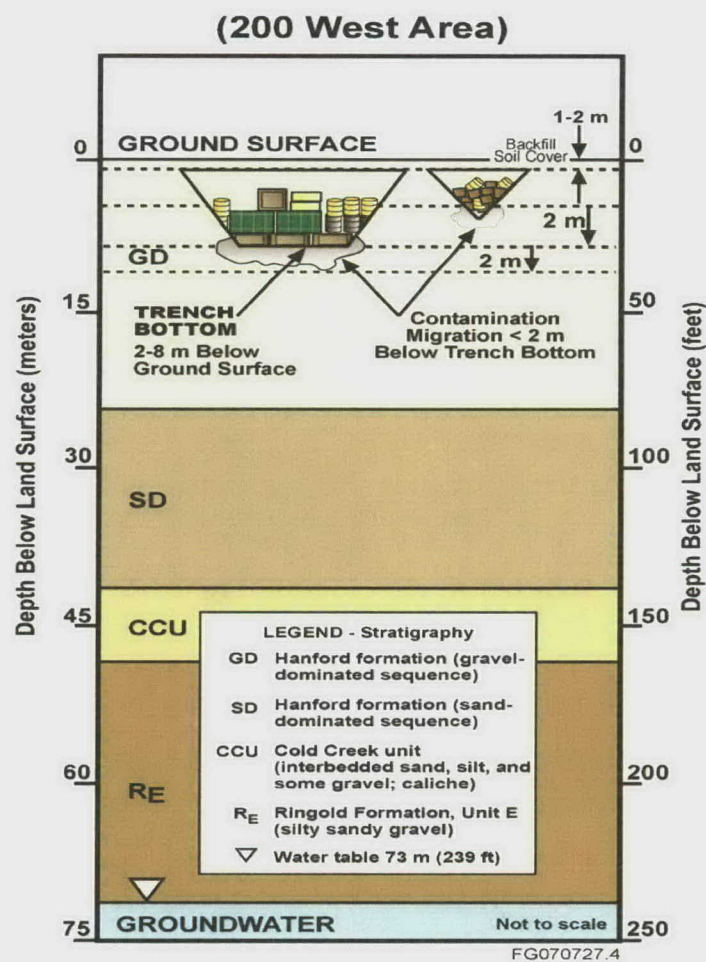
# 200-West Area Stratigraphy

**Figure 2-1. Generalized Stratigraphic Column for the Hanford Site (modified from Lindsey 1996).**

**Note: The member of Savage Island, the member of Wooded Island units C, B, and D, and the Snipes Mountain Conglomerate are not present at Waste Management Area TX-TY (southeast and adjacent to LLWMA-3).**

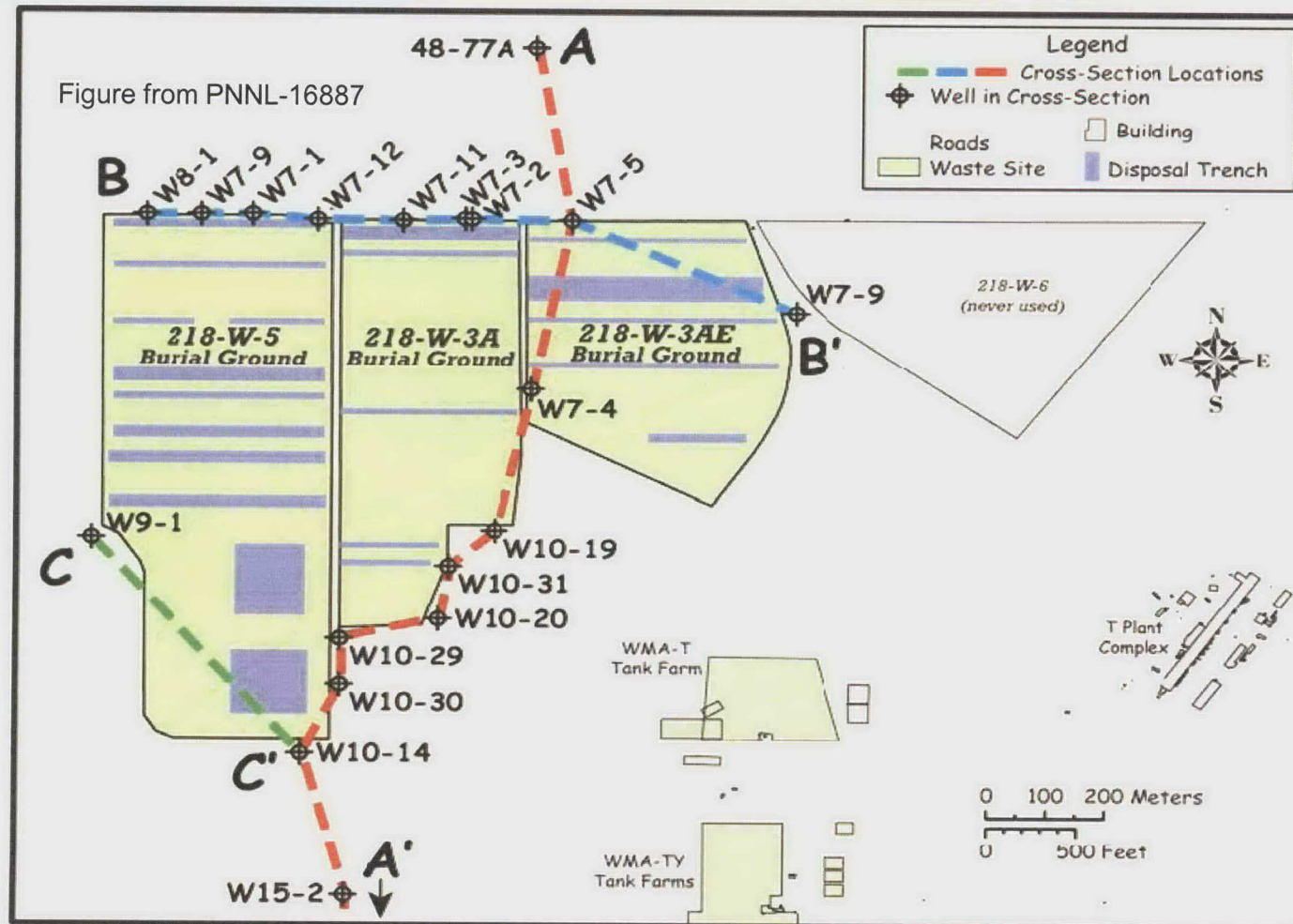


# Generalized Profile



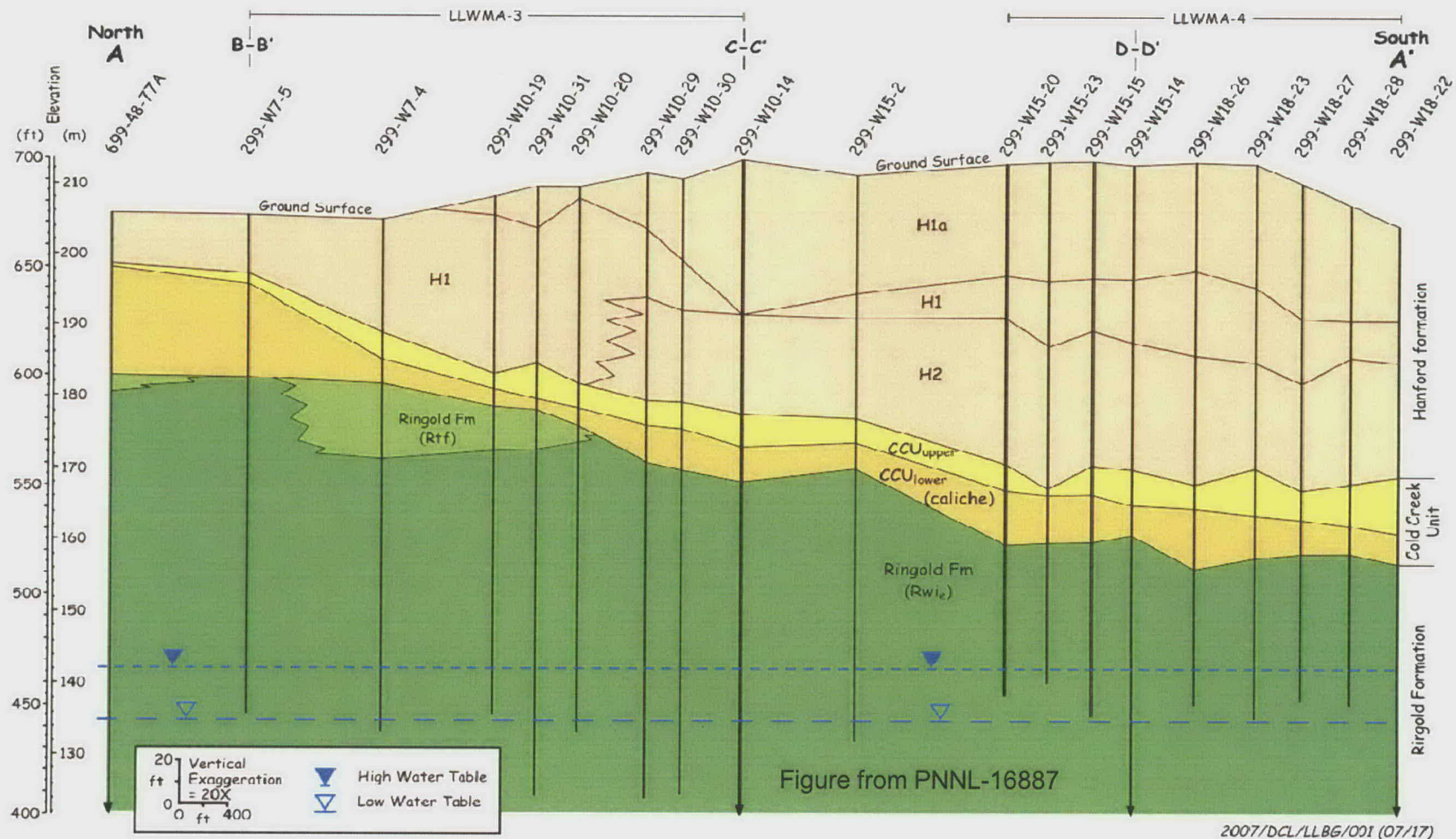


# Study Area Stratigraphy



2007/DCL/LLBG/010 (07/23)

# Study Area Stratigraphy continued..





# Study Area Stratigraphy continued..

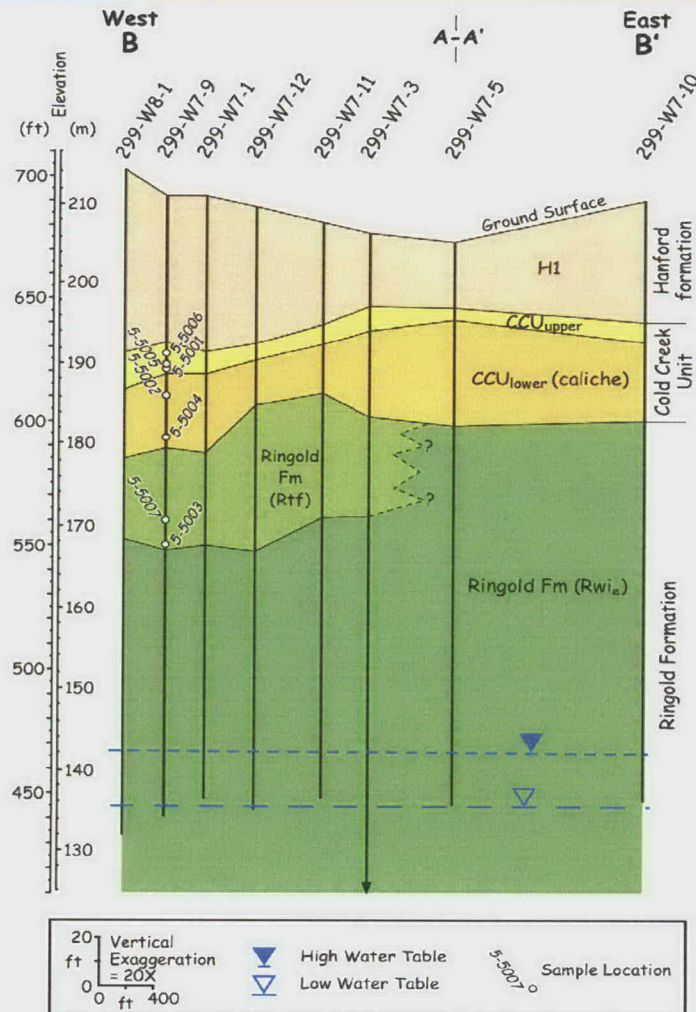


Figure from PNNL-16887

2007/DCL/LLBG/002 (07/13)

# Study Area Stratigraphy continued..

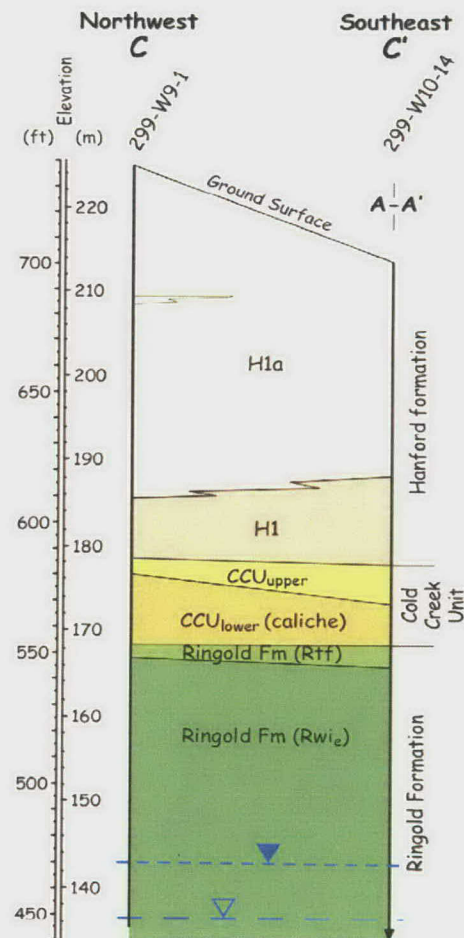


Figure from PNNL-16887



# Conceptual Site Model – Hydrogeologic Considerations

- The Cold Creek unit ranges from approximately 95 to 130 feet below ground surface in the area under the trenches.
- The Cold Creek unit may retard downward movement of moisture and contaminants because of the finer textured sediment and calcium carbonate cementing that characterize this stratigraphic feature in the vadose zone.
- The Cold Creek unit dips at a low angle from north to south beneath the LLWMA, so any lateral spreading on top of the Cold Creek unit will be toward the south-southwest.
- If contaminants do break through to groundwater beneath LLWMA-3, the contaminants would move toward the east-northeast.

# Conceptual Site Model – Hydrogeologic Considerations

- Because the trenches are considered dry waste disposal areas and waste is disposed in containers, un-expected leaks or releases probably would have small volumes (Less than 500 gallons, assuming ten 50 gallon drums leak at once and are full of liquid waste)
- Moisture retention properties for certain lithologies, such as the Cold Creek Unit and the Taylor Flat member of the Ringold Formation, within the vadose zone have high capacity to absorb and retain contaminant moisture.
- If contaminants do break through to groundwater beneath LLWMA-3, the contaminants would move toward the east-northeast.



# Conceptual Site Model – Hydrogeologic Considerations

- The flow direction has shifted from nearly north to northeast and is slowly changing eastward as the influence of the groundwater mound subsides.
- The hydraulic conductivity values derived from aquifer testing in wells completed in the upper portion of the unconfined aquifer at LLWMA-3 varied from 0.02 to 9.8 m/day (0.07 to 32.2 ft/day).
  - Assuming an average effective porosity of aquifer materials between 0.1 and 0.3, and a hydraulic gradient of 0.0014, the average flow rate is calculated at 0.0001 to 0.14 m/day (0.000328 to 0.459 ft/day).

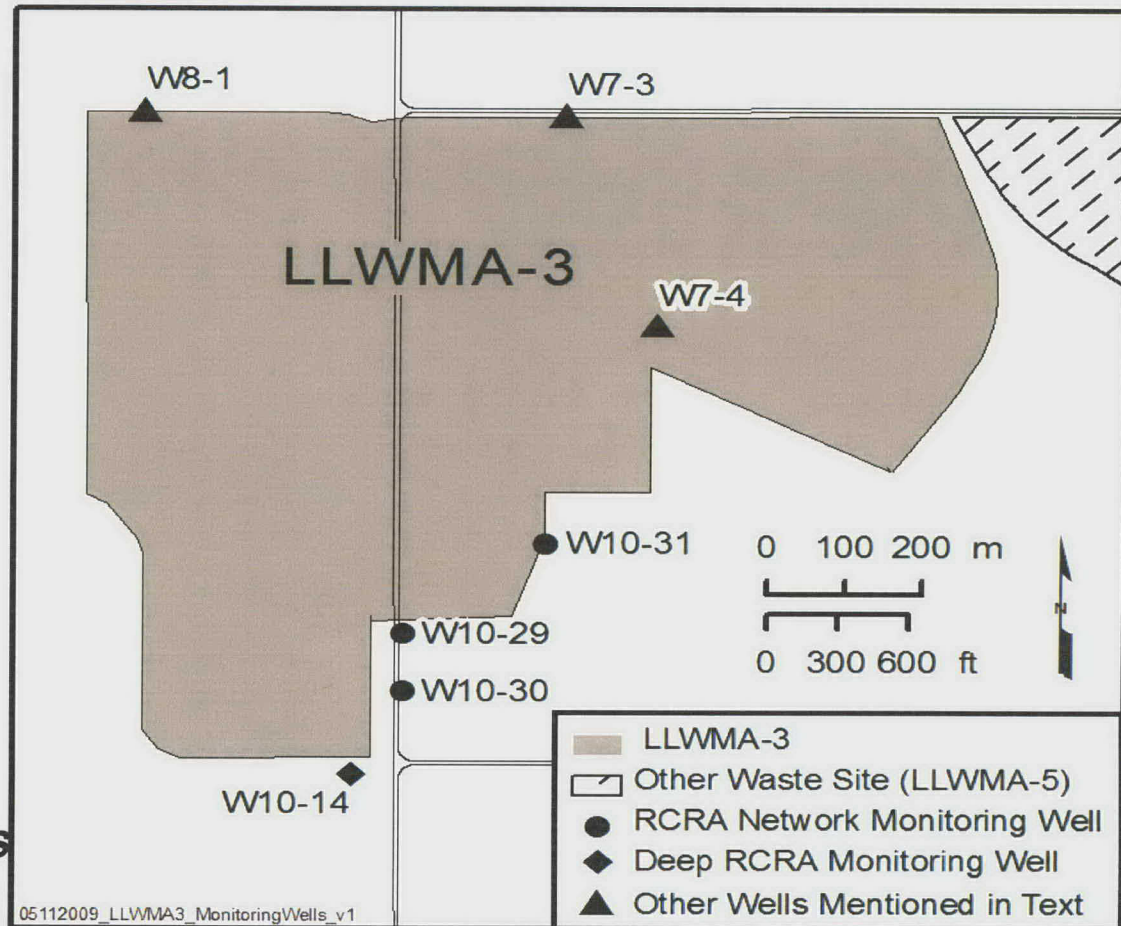






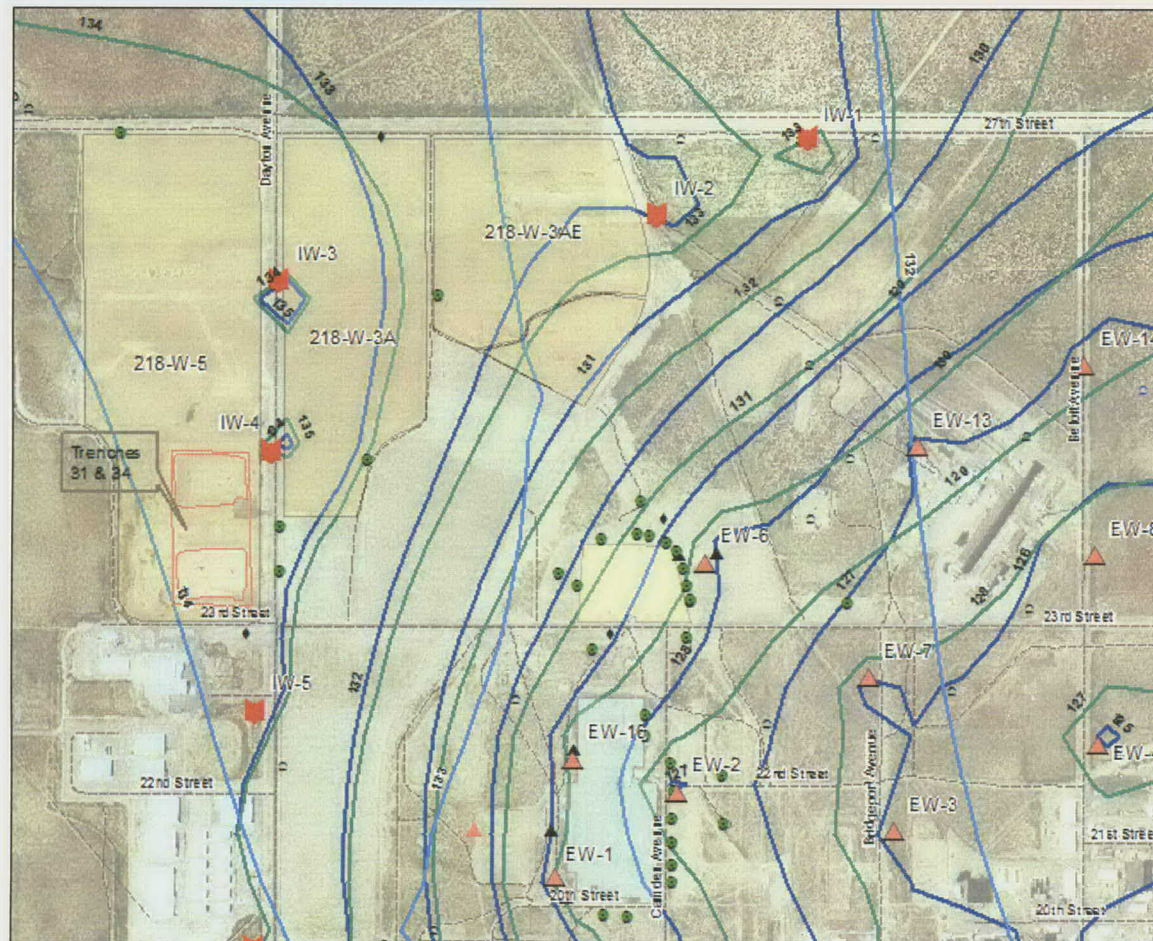
# Current (2010) LLWMA-3 Monitoring Network

- Groundwater monitoring sampling frequency is semi-annual.
- Four active monitoring wells:
  - 299-W7-3 (removed)
  - 299-W7-4 (back in network)
  - 299-W8-1 (removed)
  - 299-W10-14 (removed/deep well)
  - 299-W10-29
  - 299-W10-30
  - 299-W10-31
- No upgradient wells
- Note: Figure from DOE/RL-2009-68, Rev. 0 (*Interim Status Groundwater Monitoring Plan for the LLBG WMA-3*)





# Hydrologic Model Showing P&T Effects on Water Table (2011 – 2017)



Hydrologic Model, ECF-HANFORD-10-0371,  
Central Plateau MODFLOW Model Version 3,  
CH2M HILL Plateau Remediation Company,  
Richland, WA.

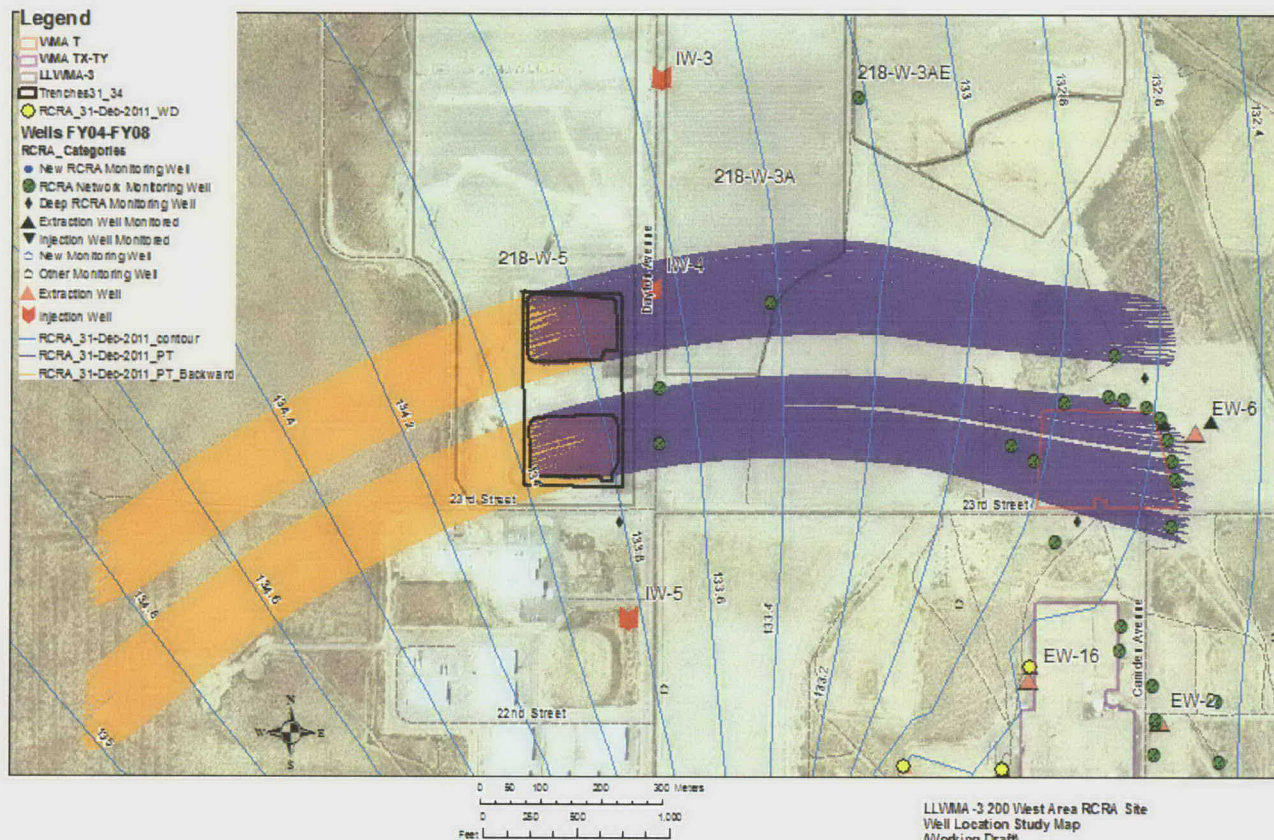
- Legend
- Trenches 31, 34
  - Current Monitoring Wells
  - RCRA Categories
  - New RCRA Monitoring Well
  - RCRA Network Monitoring Well
  - Deep RCRA Monitoring Well
  - Extraction Well Monitored
  - Injection Well Monitored
  - New Monitoring Well
  - Other Monitoring Well
  - Extraction Well
  - Injection Well
  - WMA T
  - WMA TX-TY
  - LLWMA-3
  - RCRA\_21-Dec-2011\_contour
  - RCRA\_21-Dec-2014\_contour
  - RCRA\_21-Dec-2017\_contour



LLWMA-3 200 West Area RCRA Site  
Well Location Study Map  
(Working Draft)

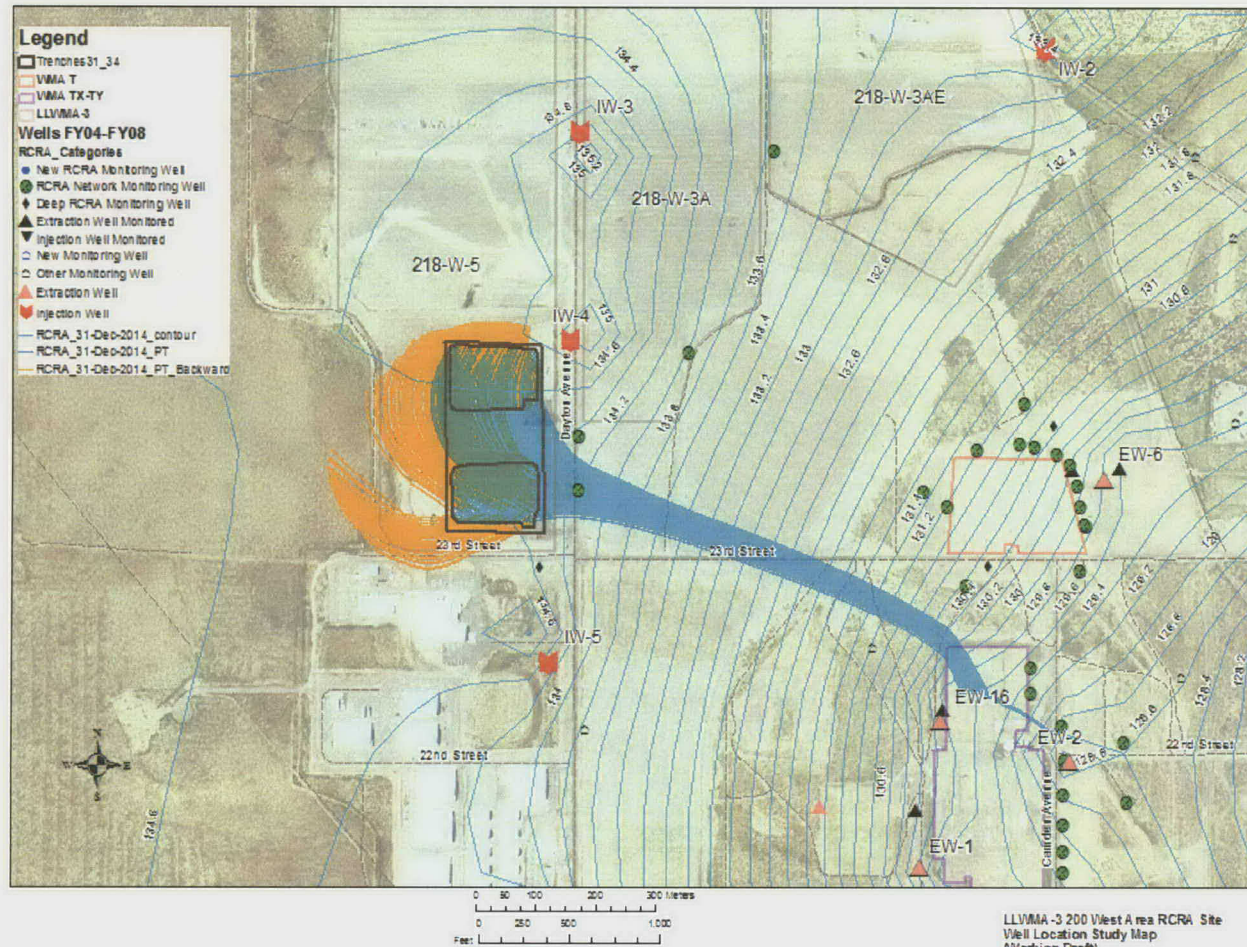


# Hydrologic Model Showing Current P&T Effects – 2010 - 2011



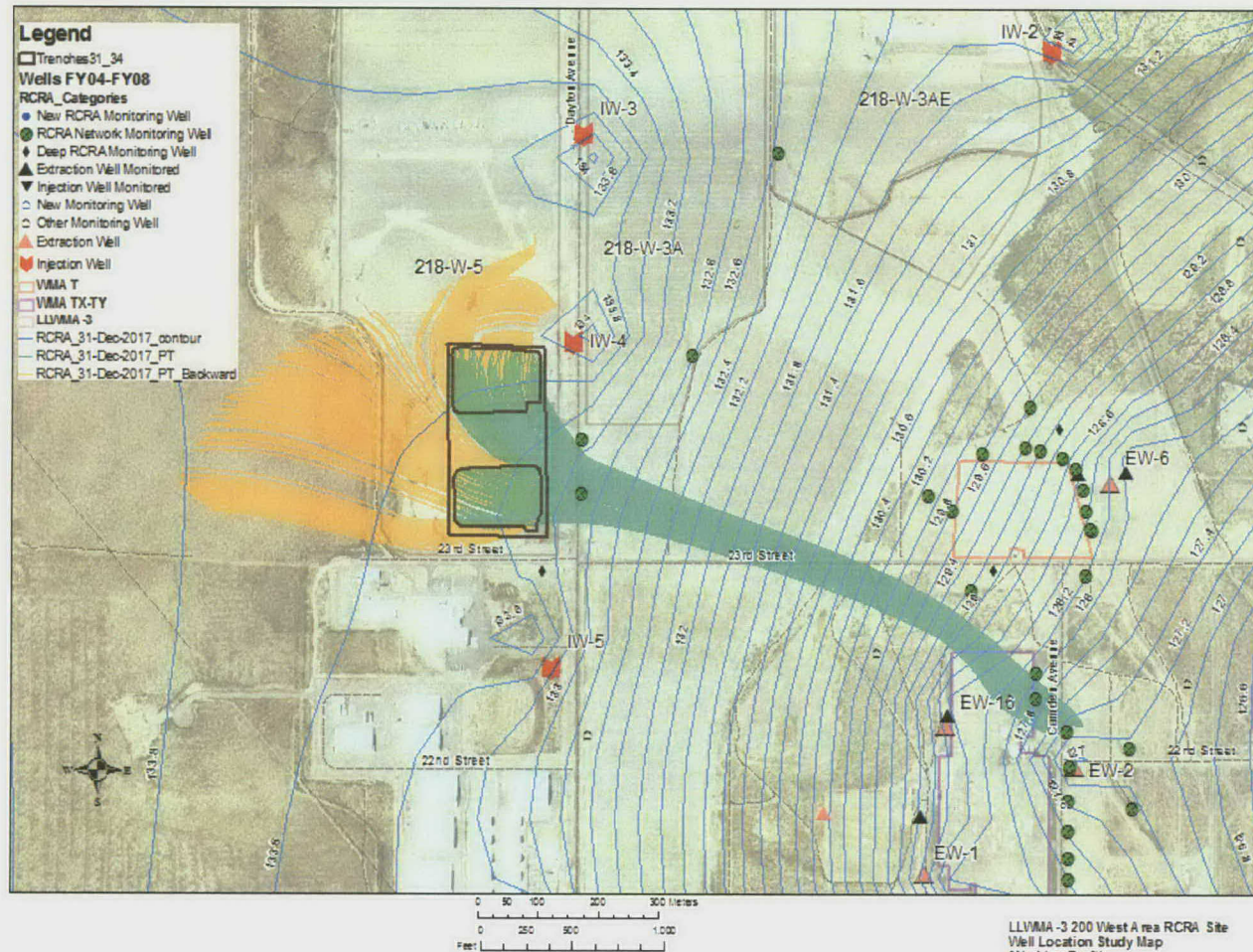


# Hydrologic Model Showing New P&T Effects - 2011 - 2014





# Hydrologic Model Showing New P&T Effects – 2014 - 2017





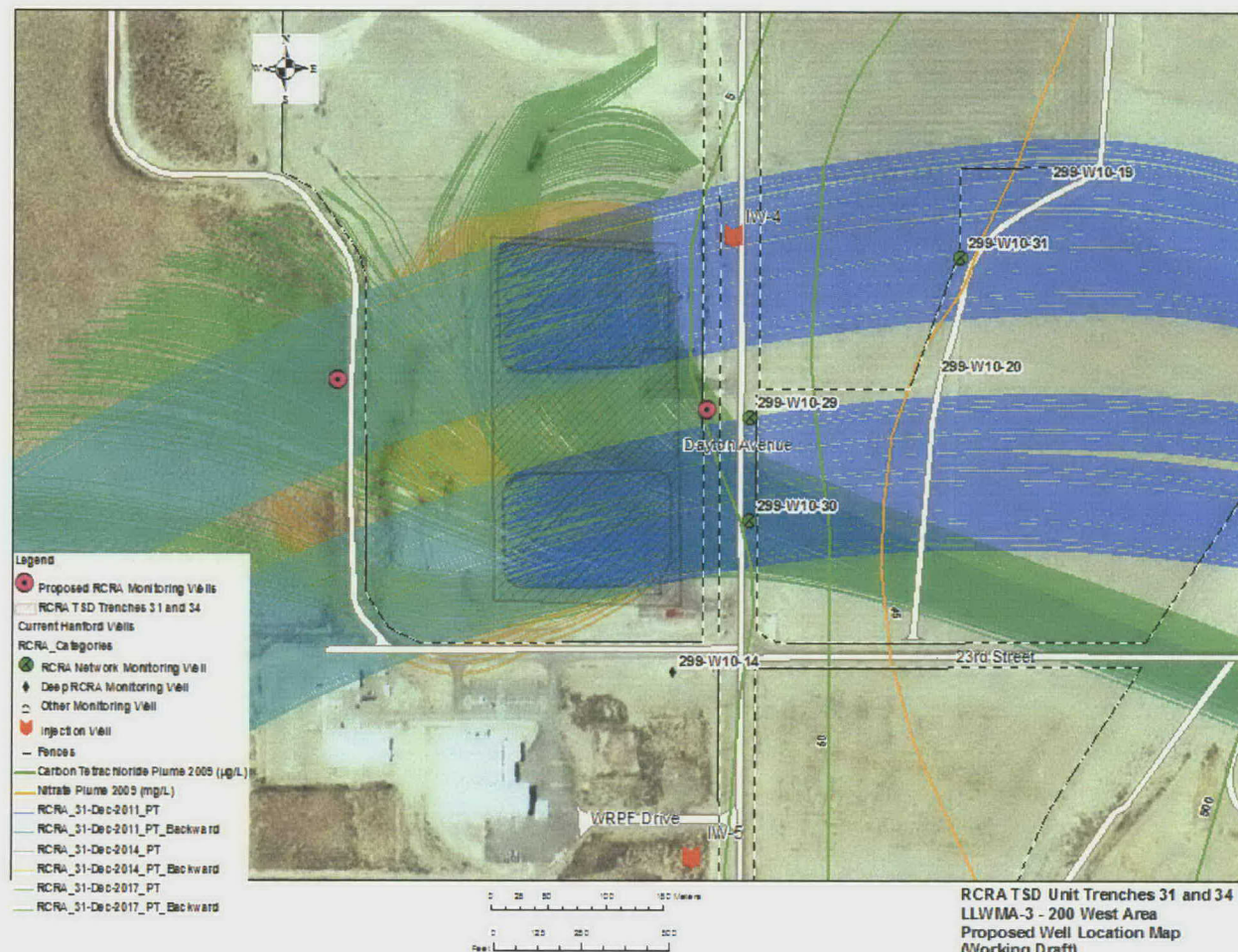
# Well Location Site Proposals

- Using the superimposed particle tracking potential monitoring well locations were plotted.

- Upgradient well could be installed as soon as possible.

- Three downgradient wells exist under current hydrologic gradient (299-W10-29, 299-W10-30 and 299-W10-31)

- IW-4 may be considered a temporary downgradient well.  
(Proposal was dismissed by group consensus)





# Well Location Site Proposals

- One upgradient well west of the Trenches

- One new downgradient well east of the Trenches

